What Does It Mean?

Reporting Category	Probability and Statistics
Topic	Describing and finding mean, median, mode, and range of a set of data
Primary SOL	5.16 The student will a) describe mean, median, and mode as measures of center; b) describe mean as fair share; c) find the mean, median, mode, and range of a set of data; and d) describe the range of a set of data as a measure of variation.
Related SOL	5.15

Materials

- Linking cubes (or counting chips, beans, or any other small items)
- Sticky notes
- Measures of Center recording sheet (attached)
- Calculators

Vocabulary

data, fair share, mean, median, mode, range, measures of center

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Have students predict how many linking cubes they can grab from a bag, using one hand. Have them record their predictions on their handouts. Record the class predictions on the overhead.
2. Have each student grab a handful of linking cubes from the bag and record the number on their sheet. Compile their results on the overhead.
3. Have each student record on a sticky note the number of cubes he/she grabbed. Have students place their sticky notes on the board from least to greatest. Put sticky notes with the same number in a row to form a bar. Use this to make a bar graph. Discuss the elements that must be included in a bar graph.
4. Have each student connect his or her cubes to build a tower of cubes.
5. Have students line up at the front of the room with their tower of cubes in hand. The student with the smallest number of cubes is first in line. Then continue across the room in numerical order. Students should line up in front of each other when they have the same number of cubes. This human bar graph should be similar to the bar graph on the board.
6. Lead the group in a discussion of the measures of center and range. Define *range* as "the difference between the largest and smallest pieces of data." Have the first person in line and the last person in the line move to the middle and compare their stacks of cubes. What is the difference in the two stacks? Record this number as the range of the class data.
7. Define *mode* as "the number that occurs most often." Lead students to discover that the longest line will be the mode. Determine the longest line, and have those students hold up

their sticky notes. Record this number as the mode of the class data. There is the possibility of having more than one mode.

8. Define *median* as "the middle number in a group of data that is arranged from smallest to largest or largest to smallest." Have the students discuss how to find the middle of their data. Have students take the hands of the students beside them and then spread out and form one long line. Then have the first person and last person in the line sit down. Continue this process until there are one or two people left standing. If there is only one person left standing have him hold up his sticky note and record this as the class median. If two people are left standing, have them use their cubes to find the number exactly in the middle of their two stacks. This will be the median.
9. Discuss *mean* and how the concept of *fair share* was used to determine the mean. Help students understand what the mean of a set of data really tells us. Encourage students to talk about ways they could find the mean using the cubes. Have students use the concept of fair share by "sharing" and linking cubes with each other until they all have about the same number of cubes. More than likely two groups will exist: some students will have stacks of one amount, and the other group will have stacks with one more cube. Describe this is an example of *mean as fair share*.
10. At this point continue to discuss *mean as fair share* and also use the term *average* as another way of describing the mean. Have students reflect on the activity and see if they can determine the mean using arithmetic. When reflecting, have the students think about what they actually did with the cubes to concretely solve for the mean by using fair share. Students can use the data generated from the activity and recorded on sticky notes and graphed. They may be able to generate a procedure that determines the arithmetic mean. The arithmetic mean is found by adding all the numbers on the graph and then divide by the number of students who participated in the activity (posted a sticky note).
11. Have students go back to their seats and record the measures of center on their sheets. Review each of the four terms.

Assessment

- **Questions**
  - How are mean, median, and mode similar?
  - How are mean, median, and mode different?
  - Describe how the range of data is determined.
  - Describe in your own words the mean as fair share.
- **Journal/Writing Prompts**
  - Explain in your own words the differences between mean, median, mode, and range. Use numbers to help you describe each.
  - Your teacher is working on your nine-week report card grade. She gave you the choice of having her use mean, median, mode, or range to calculate your grade. Explain which would you prefer, and why. (It may help to make up some grades to show what each of these is.)
- **Other**
  - Show the class grades of a recent test in the form of a stem-and-leaf plot. Ask students to find the mean, median, mode, and range of the data.

Extensions and Connections (for all students)

- Have students keep track of the number of hours of television they watch each day for a week. Figure the mode, mean, median, and range of these data. Do the measures of center vary? If they vary greatly, extend the project for 30 days.
- Give each student a small pack of round, colored candies. Make a table of data for various colors of candy in their packages. Have students find the mean, mode, range, and median for each color.
- Have students construct paper airplanes, throw the planes a given number of times, and record the distances the planes fly. Then have students find the mean, mode, median, and range for the data.

Strategies for Differentiation

- Help students remember the differences between the measures of center with the following ideas and visuals:
    - *mean* people are "MAD": Mean-Add-Divide
    - *mode* = *most*: the amount that occurs the most; *mo* begins both words
    - me**d**ian = mi**d**dle (the **d** falls in the **middle** of median)
    - Biggest
        - Smallest

      Range

Measures of Center Recording Sheet

Name _____ **Date** _____

Estimation:

Actual number of cubes I grabbed in one handful:

Number of students in class:

Total number of cubes grabbed by class:

Record the data set of the class (the number of cubes each of your classmates grabbed) in order from least to greatest in the box below.

Mean of the data:

Range of the data:

Mode of the data:

Median of the data:

Mean of the data: